International Journal Of Multidisciplinary Research In Science, Engineering And Technology (IJMRSET)
Volume 1, Issue 4, July 2020

Hybrid Power Generation Using Solar and Wind Energy

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ABSTRACT: Solar and wind energy is very important means of expanding renewable energy resources. In this paper an efficient way of solar and wind power generation technique is achieved by combined prototype.Solar is a non-conventional source of energy, In this work we have developed solar panel with tracker so that we can fulfil our electricity need. But due to revolution of the earth, solar source i.e. sun does not face the panel continuously hence less electricity is produced. The energy panel should face the SUN till it is present in a daytime alone. But the problem is we cannot generate power during night-time so this could be eliminated with the help of turbine blades to generate power during both night as well as daytime. Basically, the air flow is more at night-time compare with daytime.By combining both wind and solar energy the power production rate can be increased.

KEYWORDS: Hybrid Energy; Solar System; Wind Energy; Renewable Energy; Clean Energy; Electrical Energy Generation.

I. INTRODUCTION

Weallknowthattheworldisfacingamajorthreatoffastdepletionofthefossilfuel reserves. Most of the present energy demand is met by fossil and nuclear power plants. There will soon be a time when we will face a severe fuel shortage. As per the law of conservation of energy, “Energy can neither be created, nor be destroyed, but it can only be converted from one form to another”. Most of the research now is about how to conserve the energy and how to utilize theenergy in a better way. Among them,
the wind and solar power sources have experienced a remarkably rapid growth in the past 10 years. Hybrid power system consist of a combination of renewable energy source such as wind generators, solar etc. of charge batteries and provide power to meet the energy demand, considering the local geography and other details of the place of installation. These types of systems are not connected to the main utility grid. They arealsousedinstand-aloneapplicationsandoperateindependentlyandreliably. This project presents the Solar-Wind hybrid Power system that harnesses the renewable energies in Sun and Wind to generate and supply electricity to a private house, farm house, a small company, an educational institution or an apartment house depending on the need at the site where used.

II. LITERATURE REVIEW

NaderBarsoum[2010],GlobalJournalonTechnology,Vol.01,1985-9406states that research hasproved that solar tracking systems with single-axis freedom can increase energy output by approximately 20%, whereas the tracking system with double axis freedom can increase the output by more than 40%. Therefore, this work was to develop and implement a solar tracking system with both degree of freedom and which detects the sunlight using sensors. This Peripheral Interface Controller was the brain of the entire tracking system, and it was programmed to detect the sunlight through the sensors and then actuate the motor to position where maximum sunlight could be illuminating the surface of the solar panel. This is programmed to detect the sunlight using the photocells and then actuate the motor to position the solar panel where it can receive maximumsunlight.

Hossein Mousazadeh,[2009],in the Renewable & Sustainable Energy, Vol. 13, 1800-1818discussesdifferenttypesofsun-trackingsystemsandtheirconsandpros. The most efficient and popular sun-tracking device was found to be in the form of polar-axis and azimuth/elevationtypes.

kpekiU.K.et.Al.,International Journal of Engineering & Science Vol. 2 (2013) PP. 32-38, describes the design and construction of a bi-directional solar tracking system. The constructed device was implemented by integrating it with 900V inverter and 12volts, 100AH battery. The amount of power available from a photovoltaic panel is determined by

three parameters, the type and area of the materials, the intensity of the sunlight and the wavelength of the sunlight. With advancement in solar panel technology, parameter one, the type and area of the material had been fully improved upon and standardized. In this research work the othertwoparameterswerefullyaddressed,asthisdeviceensuresmaximumintensity of sun rays hitting the surface of the panel from sunrise to sunset. Test showed that power used by tracker system is less than the power gain by tracking the sun accurately. The most important conclusion of this research is the total cost of construction of the tracker system is verylow.

TiberiuTudorache[2012],U.P.B.Sci.Bull, Vol.74,ISSN11454-234discussedthe performance of a single axis solar tracking PV panel designed and executed by University Polytechnical of Bucharest in cooperation with Techno soft International SRL. The performance of the equipment was experimentally tested in comparison with a fixed PV panel. This paper deals with the performance estimation of a solar tracking PV panel of single axis type. The studied device automatically searches the optimum PV panel position with respect to the sun by means of a DC motor controlledbyan intelligentdriveunitthatreceivesinputsignalsfromdedicatedlight intensity sensors. The recorded data on day proved that the solar tracking PV panel produced more energy than the fixed one with about 57.55%. Considering the own energy consumption of the tracking mechanism, the mobile PV panel becomes less attractive than the fixed one, the tracking mechanism being oversized. If higher power PV panels are driven by the same tracking mechanism, they may produce more energy than the fixed ones e.g. about 38% more energy in case of a 100 Wp PV panel, under the same experimentalconditions.

Mohsen Taherbaneh (2010), International Journal of Photo energy, Article 312580isconcernedwithmethodbasedonsimultaneoususeoftwofuzzycontrollers developed in order to maximize the generated output power of a solar panel in a photovoltaicsystem,afuzzy-basedsuntrackingandmaximumpowerpointtracking.Three methods to maximize the output power of a solar panel were employed here. Fuzzy-based maximum power point tracking was the first technique. It is observed that by use of the technique, approximately23W was obtained during the measurement time, which is about 51 percent of the nominal output power. In the second method, fuzzy-based sun tracking was applied, and it is observed that approximately11Wwasobtainedduringthemeasurementperiod,whichisabout24.5 % of the nominal output power. The result is expected because sun tracking wasonlyemployedwithoutmaximumpowerpoint trackingand soasmallamountof the nominal power was obtained from the solar panel. Finally, the combination of fuzzy based maximumpowerpointtrackingandfuzzy-basedsun trackingwasusedto maximize the output power. It was seen that by simultaneous use of those techniques, the output power could reach 35W, which is about 78% of the nominal output power.

Ahmed Rhif et al., (2012), International Journal of Control Theory & Computer Modeling Vol.2, review the literature on tracking process for the dual axis sun tracker by a sliding mode control law. The sun tracker considered in this study has two degrees of freedom and is significant due to lack of sensors. In this way, the tracker will have a set of sun positions at every second during the day for a period offive years.Aftersunset,thetrackergoesbacktotheinitialpositioncorresponding to sunrise. Experimental measurements show that this autonomic dual axis sun tracker increases the power production by over 40%. Experimental results show the effectiveness of the sliding mode control in the tracking process, its robustness and the high estimation quality of the sliding modeobserver.

MostefaGhassoul, (2013), IJETAE, Vol. 3, No. 5, 2250-2459, describes in his paper design, construction and testing of a cost-effective intelligent sun tracking system to extract maximum solar energy. It is designed to be driven by amicrochip PIC18F452microcontroller.Thesystemisbasedontwomechanisms.Thefirstone is the search mechanism (PILOT) which locates the position of the sun. The second mechanism (intelligent PANELS) aligns itself with the PILOT only if maximum energy possible could beextracted.

III. METHODOLOGY

The major building blocks of the project:
1. Microcontroller.
2. Solar panel with the solar tracking.
3. Wind mill.
4. Battery & inverter.

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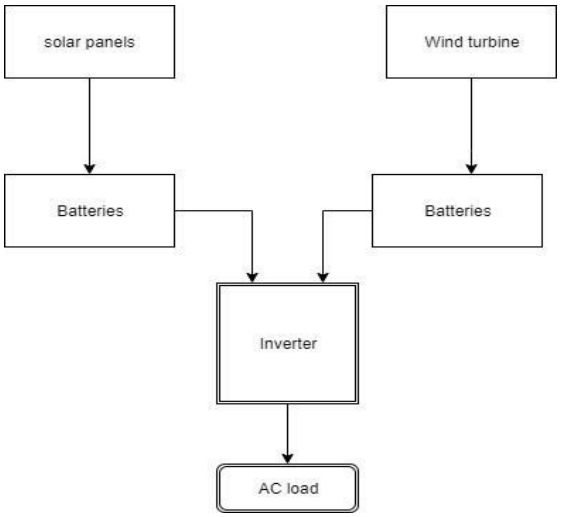
IV. BLOCK DIAGRAM/DESCRIPTION

The proposed system is the hybrid/combination of two individual system as, solar system and wind system. The block wise description is as follows,



Solar Panel:
Solar panels are photovoltaic which, generates electrical energy using sun light radiations. Depending on the position and intensity of the sun radiation the amount of electrical DC energy will produced. For the proposed project specifications and design, a 12V, 150 watts off grid solar panel is required. The standard size of the panel, available in the market, 48inch x 22inch x 2inches is most suitable however, other sizes can be considered.

Wind turbine:
Wind Turbine is mechanical system/machine which generates electrical energy from renewable wind energy source. Depending on the speed of the wind the amount of electrical AC energy will produced. For the project, a 500 watt, having 3 blades of 1-meter radius, wind turbine generator will be needed. The height of the wind turbine should be 18 meters. For foundation of it a 2 x 2 x 4 m space required.

Batteries:
The electrical energy produced by the system needs to be either utilized completely or stored. The energy generated from the proposed project needs to be store. So, two batteries is needed. One is attached to wind turbine for which a 120AmpH battery will be required, which will be fair enough full fill the storage capacity for targeted value. The second battery is 80AmpH is preferred for storing solar energy. But, as per application/ storage and demand battery capacity can be variable.

Inverter:
The input energy is in DC (12V) form stored in the batteries. It will convert it into AC with ~230V, 500W (the maximum value of load to be attach), ~50Hz specification matching with the household mains supply. At output, AC loads can be attached.

V. CONCLUSION

Hybrid power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide to remote places where government is unable to reach. So that the power can be utilize where it generated so that it will reduce the transmission losses and cost. Cost reduction can be done by increasing the production of the equipment. People should motivate to use the non-conventional energy resources. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy resources. It is cost effective solution for generation. It only needs initial investment. It has also long-life span. Overall it good, reliable and affordable solution for electricity generation.

REFERENCES

1.Sukhatme, S. P., and Nayak, J. K., 2008, Solar Energy: Principles of Thermal Collectionand Storage, McGraw-Hill, NewYork.
2.Baghernejad, A., and Yaghoubi, M., 2010, "Exergy Analysis of an Integrated Solar Combined Cycle System," Renewable Energy, 35, pp.2157–2164.
3.Zamfirescu, C., and Dincer, I., 2009, "How Much Exergy Can One Obtain fromIncident Solar Radiation?" J. Appl. Phys., 105,044911

4.T.S. Balaji Damodhar and A. Sethil Kumar, “Design of high step up modified for hybrid solar/wind energy system,” Middle East Journal of Scientific Research 23 (6) pp.1041-1046, ISSN 1990-9233,2015.
5. WalaaElshafee Malik Elamin, “Hybrid wind solar electric power system,” report,University of Khartoum, Index-084085, July2013.
6.Sandeep Kumar and Vijay Garg, “Hybrid system of PV solar/wind & fuel cell,”IJAREEIE, Vol. 2, Issue 8, ISSN 2320-3765, August 2013.
7.Rakeshkumar B. Shah, “Wind solar hybrid energy conversion system- leterature review,” International Journal of Scientific Research, Vol. 4, Issue 6, ISSN 2277-8179, June2015.
8.Ugur FESLI, Raif BAYIR, Mahmut OZER, “Design & Implementation of Domestic Solar- Wind Hybrid Energy System”, ZonguldakKaraelmas University, Department of Electricaland Electronics Engineering, Zonguldak, Turkey.
9.Nazih Moubayed, Ali El-Ali, Rachid Outbib, “Control of a Hybrid Solar-Wind Systemwith Acid Battery forStorage”,Wseas Transactions on Power System, Labortory of Science in Information and System (LSI), Axi-Marseille University, France
10.Rohit Sen, Subhes C. Bhattacharyya, "Off-grid electricity generation with renewable energy technologies in India: An application of HOMER", *Renewable Energy*, vol. 62, pp. 388398, February 2014.
11.Mei Shan Ngan, Chee Wei Tan, "Assesment of economic viablity for PV/Wind/Diesel hybrid energy system in southern Peninsular malaysia", *Renewable and Sustainable energy reviews*, 2011.
12.Jon Gustav Kirkerud, Erik Trmborg, TorjusFolslandBolkesj, saGrytliTveten, "Modeling the power market impacts of different scenarios for the long-term development of the heat sector", *Energy Procedia*, vol. 58, pp. 145151, 2014.
13.T. Som, N. Chakraborty, "Studies on Economic Feasibility of an Autonomous Power Delivery System Utilizing Alternative Hybrid Distributed Energy Resources", *IEEE Transactions on Power Systems*, vol. 29, no. 1, pp. 172-181, January 2014.
14.Jeng-Yue Chen, J. Gilmore, J Roesch, Wei Zhu, "LCOE reduction for megawatts PV system using efficient 500 kW transformerless inverter", *Energy Conversion Congress and Exposition (ECCE)*, pp. 392-397, Sept 2010.
15.Viktor Mikls Kiss, "Modelling the energy system of Pcs The first step towards a sustainable city", *Energy*, vol. 80, pp. 373387, Feb 2015.
16.I. A. Adejumobi, S.G. Oyagbinrin, F. G. Akinboro& M.B. Olajide, “Hybrid Solar and Wind Power: An Essential for Information Communication Technology Infrastructure and people in rural communities”, IJRRAS, Volume 9, Issue1, October 2011, pp 130-138.
17.Kavita Sharma, Prateek Haksar “Designing of Hybrid Power Generation System using Wind Energy- Photovoltaic Solar Energy- Solar Energy with Nanoantenna” Internationa Journal of Engineering Research and Applications.